

# **2010 Bunker Hill Superfund Site Coeur d'Alene Basin Blood Lead Levels**

---

Idaho Department of Health and Welfare  
Idaho Department of Environmental Quality  
Panhandle Health District  
United States Environmental Protection Agency

February 2011

# **Lead Health Intervention Program (LHIP)**

## **Annual Blood Lead Surveys**

- **Public health service offered by the State**
- **Not a study or experiment**
- **Box since 1974/1985**
- **Basin since 1996**

# **Panhandle Health District LHIP Procedures**

**No cash incentive for participants that live:**

- **within the Box and are between *6 months and 9 years of age*, or**

**\$20.00 cash incentive for participants that live:**

- **within the Coeur d'Alene River Basin and are between *6 months and 6 years of age***

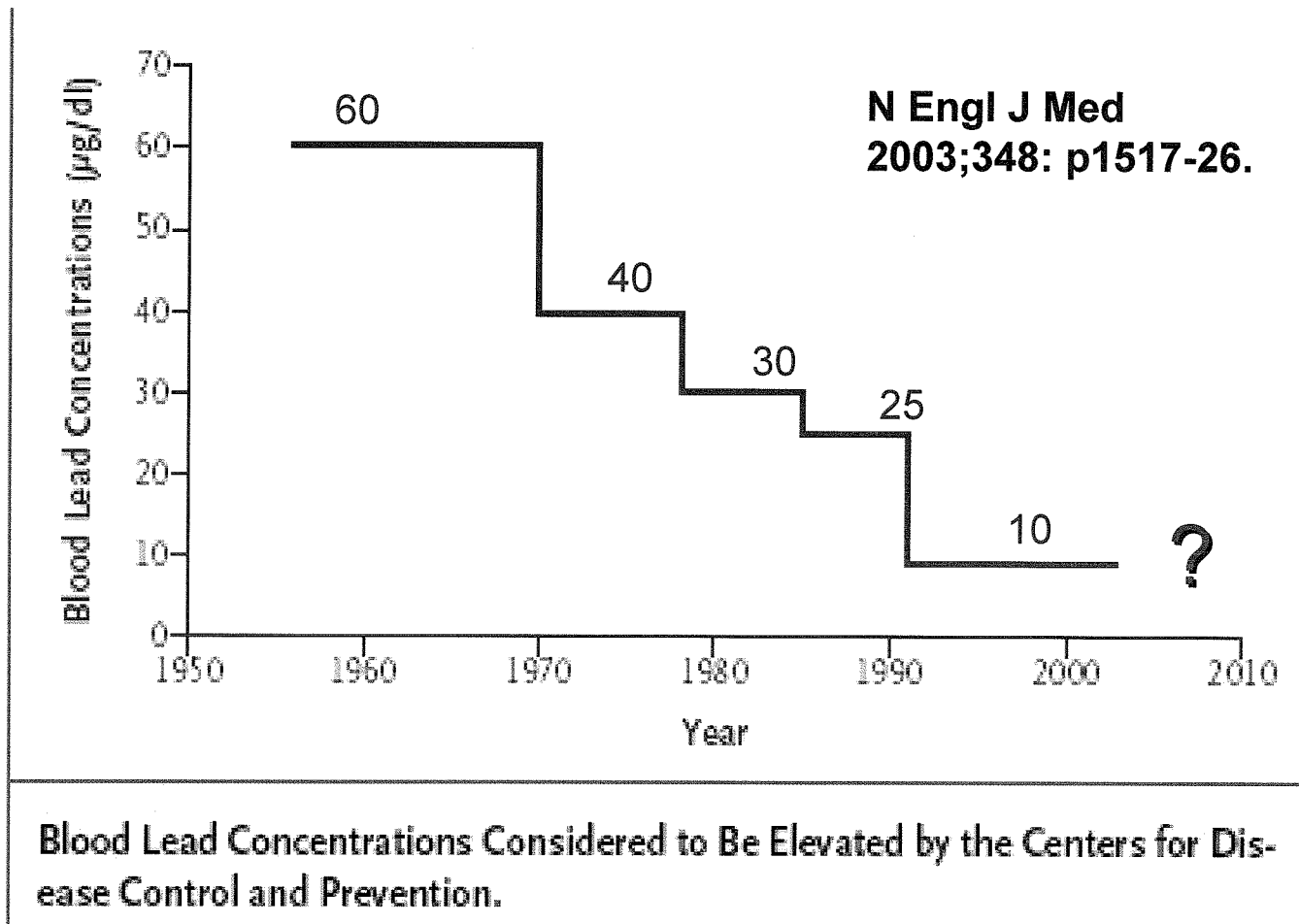
- **Prior to blood draws, the parent/legal guardian or adult participant must sign a Consent Form and complete the appropriate Questionnaire**

# **Panhandle Health District LHIP Procedures**

- **Screening blood test is done by skin puncture (capillary or fingerstick - FS)**
- **Results of capillary test are provided to the participant or parent immediately after analysis**

# Health Effects

# Decreasing “elevated” blood lead levels



# **Neurotoxic Effects**

- **Neurobehavioral effects in early development persist into adolescence and young adulthood**
- **Neurocognitive effects associated blood lead levels of 5-10  $\mu\text{g}/\text{dl}$**
- **A decline of 6.2 IQ points results from a blood lead change from 1 to 10  $\mu\text{g}/\text{dl}$  (pooled results from 7 studies)**

# **Cardiovascular Effects**

- **Increase in blood pressure (hypertension)**

# **Other Organ System Effects**

- **Renal effects**
- **Immune system effects**
- **Bone and teeth effects**
- **Heme-synthesis effects**
- **Reproductive and developmental effects**
- **Adrenal effects**
- **Liver Effects**
- **Gastrointestinal Effects**
- **Metabolism Effects**
- **Genotoxic Effects**
- **Carcinogenic Effects**

# **At Risk Populations**

- **Children**
- **Pregnant women**
- **Adults with cumulative exposure**
- **Genetically pre-disposed Individuals**

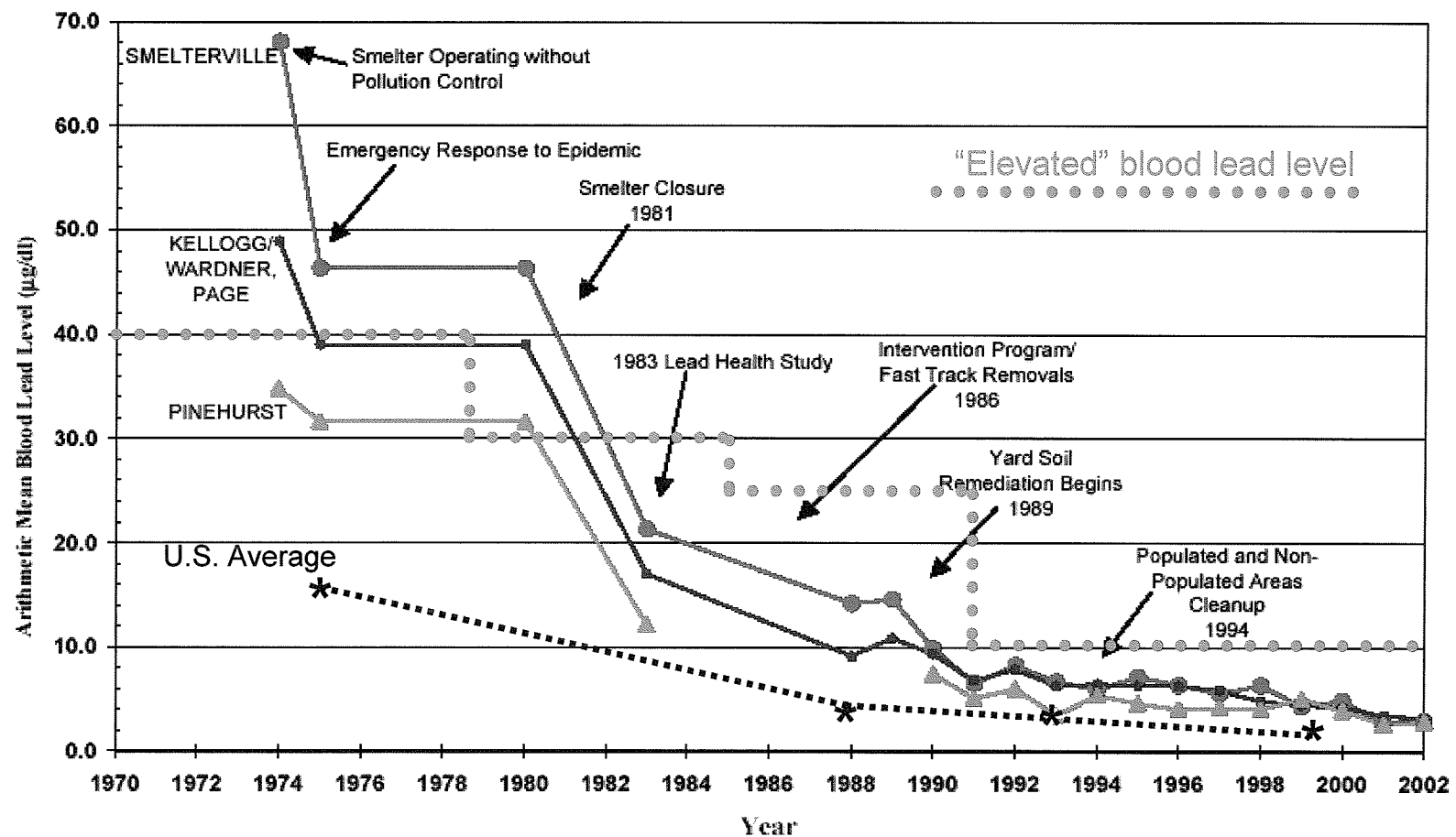
**“There is no level of Pb exposure that has yet been identified, with confidence, as clearly not being associated with possible risk of deleterious health effects.”**

# Box History

# Bunker Hill Box

## Average Blood Lead: 1974-2002

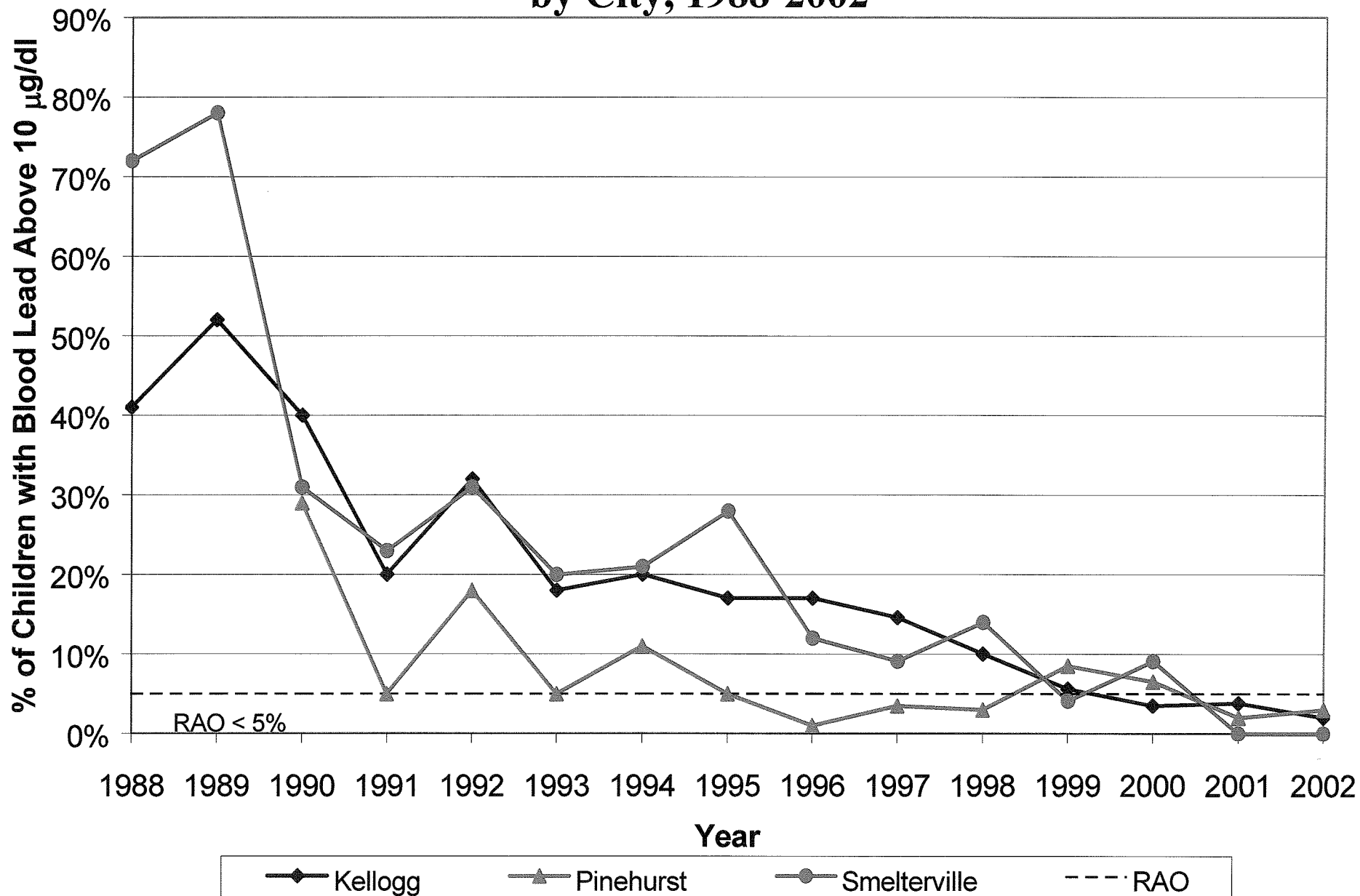
Children's Blood Lead Levels by Year, 1974-2002



# **Bunker Hill Box Superfund Site Remedial Action Objective**

- 95% of all children in each community with blood lead levels  $<10 \mu\text{g/dl}$
- No children (i.e.  $<1\%$ ) with blood lead levels  $\geq 15 \mu\text{g/dl}$

# Percent of Box Children with Blood Lead Levels $\geq 10 \mu\text{g/dl}$ , by City, 1988-2002



# Box Lead Health Intervention Summary Statistics 1988-1994

Year	Number of children in survey	Mean blood Pb ( $\mu\text{g}/\text{dl}$ )	Number of children with blood Pb ( $\mu\text{g}/\text{dl}$ )			Percent of children $\geq 10 \mu\text{g}/\text{dl}$
			$\geq 25$	$\geq 15$	$\geq 10$	
<b>1988*</b>	<b>230</b>	<b>9.9</b>	<b>7</b>	<b>35</b>	<b>105</b>	<b>46%</b>
<b>1989*</b>	<b>275</b>	<b>11.4</b>	<b>8</b>	<b>71</b>	<b>154</b>	<b>56%</b>
<b>1990</b>	<b>362</b>	<b>8.9</b>	<b>2</b>	<b>41</b>	<b>134</b>	<b>37%</b>
<b>1991</b>	<b>365</b>	<b>6.3</b>	<b>2</b>	<b>17</b>	<b>56</b>	<b>15%</b>
<b>1992</b>	<b>415</b>	<b>7.4</b>	<b>3</b>	<b>31</b>	<b>110</b>	<b>27%</b>
<b>1993</b>	<b>445</b>	<b>5.6</b>	<b>1</b>	<b>10</b>	<b>66</b>	<b>15%</b>
<b>1994</b>	<b>416</b>	<b>6.2</b>	<b>1</b>	<b>15</b>	<b>71</b>	<b>17%</b>

\*does not include Pinehurst

# Box Lead Health Intervention

## Summary Statistics 1995-2002

Year	Number of children in survey	Mean blood Pb ( $\mu\text{g}/\text{dl}$ )	Number of children with blood Pb ( $\mu\text{g}/\text{dl}$ )			Percent of children $\geq 10 \mu\text{g}/\text{dl}$
			$\geq 25$	$\geq 15$	$\geq 10$	
<b>1995</b>	<b>405</b>	<b>6.0</b>	<b>2</b>	<b>20</b>	<b>62</b>	<b>15%</b>
<b>1996</b>	<b>397</b>	<b>5.8</b>	<b>2</b>	<b>13</b>	<b>49</b>	<b>12%</b>
<b>1997</b>	<b>337</b>	<b>5.4</b>	<b>0</b>	<b>6</b>	<b>36</b>	<b>11%</b>
<b>1998</b>	<b>375</b>	<b>4.8</b>	<b>0</b>	<b>5</b>	<b>31</b>	<b>8%</b>
<b>1999</b>	<b>370</b>	<b>4.7</b>	<b>0</b>	<b>3</b>	<b>23</b>	<b>6%</b>
<b>2000</b>	<b>320</b>	<b>4.3</b>	<b>0</b>	<b>5</b>	<b>17</b>	<b>5%</b>
<b>2001</b>	<b>322</b>	<b>3.2</b>	<b>0</b>	<b>4</b>	<b>10</b>	<b>3%</b>
<b>2002</b>	<b>368</b>	<b>3.1</b>	<b>0</b>	<b>3</b>	<b>7</b>	<b>2%</b>

# 2010 Blood Lead Summary

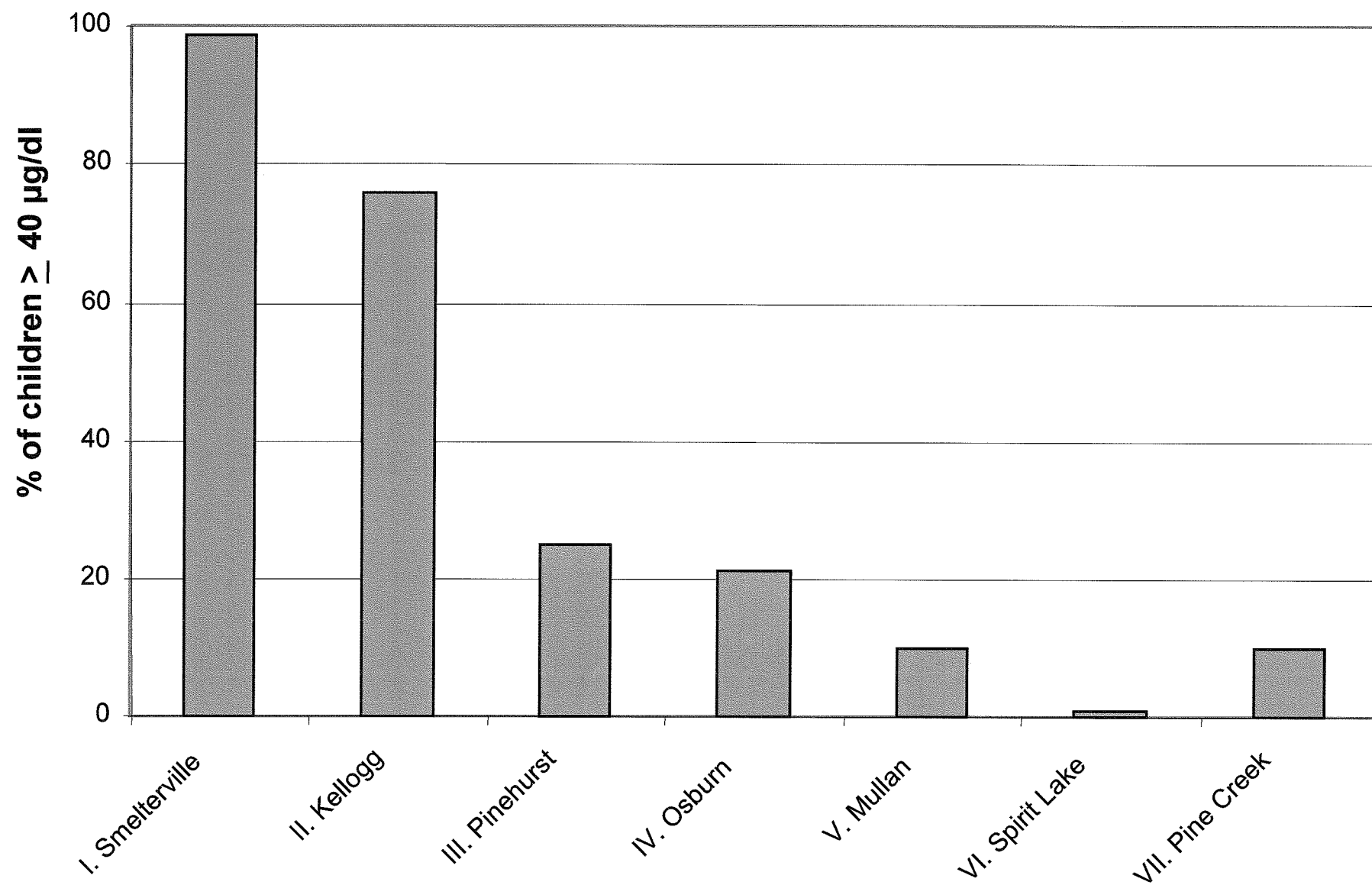
## Statistics – Box (age 0-9)

Total Number of Children (N)	13
Minimum (µg/dl)	1.6
Maximum (µg/dl)	10.0
Average (µg/dl)	3.5
Standard Deviation	2.2
Geometric Mean (µg/dl)	3.0
Geometric Standard Deviation	1.7

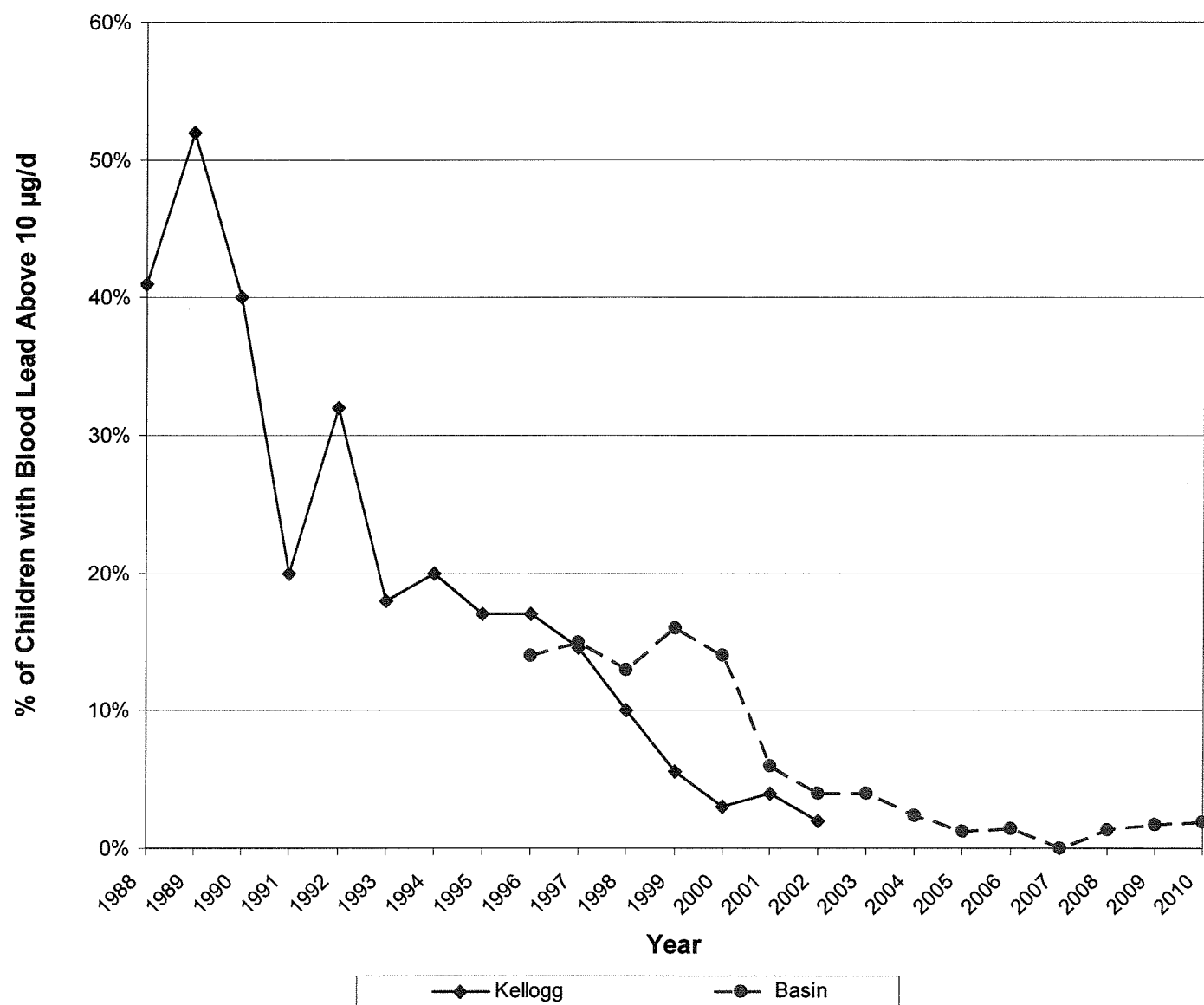
		Percentage
Total Number of Children (N)	13	
Number of Children $\geq 10$ µg/dl	1	7.7%
Number of Children $\geq 15$ µg/dl	0	0%
Number of Children $\geq 20$ µg/dl	0	0%

# Basin History

## Blood Lead Levels by Area, 1974



**Percent of Children with Blood Lead Levels  $\geq 10$   $\mu\text{g}/\text{dl}$ ,  
Kellogg and Basin, 1988-2010**



# **2010 Blood Lead Summary Statistics – Basin (age 0-6)**

<b>Total Number of Children (N)</b>	<b>108</b>
<b>Minimum (µg/dl)</b>	<b>1.4</b>
<b>Maximum (µg/dl)</b>	<b>20.0</b>
<b>Average (µg/dl)</b>	<b>2.5</b>
<b>Standard Deviation</b>	<b>2.3</b>
<b>Geometric Mean (µg/dl)</b>	<b>2.1</b>
<b>Geometric Standard Deviation</b>	<b>1.6</b>

		<b>Percentage</b>
<b>Total Number of Children (N)</b>	<b>108</b>	
<b>Number of Children <math>\geq 10</math> µg/dl</b>	<b>2</b>	<b>1.9%</b>
<b>Number of Children <math>\geq 15</math> µg/dl</b>	<b>1</b>	<b>0.9%</b>
<b>Number of Children <math>\geq 20</math> µg/dl</b>	<b>1</b>	<b>0.9%</b>

# Basin Blood Lead Summary

## by Year, 1996 - 2003 (age 0-6 only)

Year	1996	1997	1998	1999	2000	2001	2002	2003
<b>N</b>	58	13	70	162	101*	117	103	75
<b>N ≥ 10 µg/dl</b>	8	2	9	26	14	7	4	3
<b>% ≥ 10 µg/dl</b>	14%	15%	13%	16%	14%	6%	4%	4%
<b>N ≥ 15 µg/dl</b>	3	1	4	12	4	2	0	2
<b>% ≥ 15 µg/dl</b>	5%	8%	6%	7%	4%	2%	0%	3%
<b>N ≥ 20 µg/dl</b>	0	0	2	4	1	0	0	0
<b>% ≥ 20 µg/dl</b>	0%	0%	3%	2%	1%	0%	0%	0%

\*1 child from 2000 was removed from the summary because the associated address was outside the Basin boundaries.

# Basin Blood Lead Summary by Year, 2004 - 2010 (age 0-6 only)

Year	2004	2005	2006	2007	2008	2009	2010
N	80*	81	69	71	73	175	108
N $\geq$ 10 $\mu\text{g/dl}$	2	1	1	0	1	3	2
% $\geq$ 10 $\mu\text{g/dl}$	2.5%	1%	1%	0%	1.4%	1.7%	1.9%
N $\geq$ 15 $\mu\text{g/dl}$	1	0	0	0	0	0	1
% $\geq$ 15 $\mu\text{g/dl}$	1%	0%	0%	0%	0%	0%	0.9%
N $\geq$ 20 $\mu\text{g/dl}$	0	0	0	0	0	0	1
% $\geq$ 20 $\mu\text{g/dl}$	0%	0%	0%	0%	0%	0%	0.9%

\*2 children from 2004 were removed from the summary because the associated addresses were outside the Basin boundaries.

# Basin Blood Lead Summary

## by Year, 1996 - 2003 (age 0-6 only)

Year	1996	1997	1998	1999	2000	2001	2002	2003
N	58	13	70	162	101*	117	103	75
Min (µg/dl)	1	2	2	1	1	1.4	1.4	1
Max (µg/dl)	18.0	19.0	21.0	29.0	27.0	16.0	13.0	17.1
Ave (µg/dl)	5.2	6	6.3	6.4	5.8	4.5	3.7	4.1
GeoMean (µg/dl)	4.2	4.9	5.4	5.2	4.8	3.7	3.2	3.4

\*1 child from 2000 was removed from the summary because the associated address was outside the Basin boundaries.

# **Basin Blood Lead Summary by Year, 2004 - 2010 (age 0-6 only)**

<b>Year</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>N</b>	<b>80*</b>	<b>81</b>	<b>69</b>	<b>71</b>	<b>73</b>	<b>175</b>	<b>108</b>
<b>Min (µg/dl)</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>
<b>Max (µg/dl)</b>	<b>16.7</b>	<b>12.0</b>	<b>10.0</b>	<b>9.0</b>	<b>14.0</b>	<b>10.0</b>	<b>20.0</b>
<b>Ave (µg/dl)</b>	<b>3.9</b>	<b>2.9</b>	<b>2.8</b>	<b>2.9</b>	<b>2.4</b>	<b>3.1</b>	<b>2.5</b>
<b>GeoMean (µg/dl)</b>	<b>3.4</b>	<b>2.3</b>	<b>2.4</b>	<b>2.6</b>	<b>2.1</b>	<b>2.7</b>	<b>2.1</b>

\*2 children from 2004 were removed from the summary because the associated addresses were outside the Basin boundaries.

# **2010 Basin Blood Lead Summary**

## **Statistics by Area**

<b>Area</b>	<b>Burke (Ninemile)</b>	<b>Mullan</b>	<b>Osburn</b>	<b>Wallace</b>
<b>N</b>	<b>7</b>	<b>10</b>	<b>28</b>	<b>5</b>
<b>Min (µg/dl)</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>
<b>Max (µg/dl)</b>	<b>2.8</b>	<b>5.6</b>	<b>4.1</b>	<b>4.0</b>
<b>Ave (µg/dl)</b>	<b>1.8</b>	<b>2.1</b>	<b>2.0</b>	<b>2.2</b>
<b>GeoMean (µg/dl)</b>	<b>1.8</b>	<b>1.9</b>	<b>1.9</b>	<b>2.1</b>

# **2010 Basin Blood Lead Summary**

## **Statistics by Area**

<b>Area</b>	<b>Kingston</b>	<b>Lower Basin</b>	<b>Side Gulches</b>	<b>Silverton</b>
<b>N</b>	<b>23</b>	<b>11</b>	<b>19</b>	<b>5</b>
<b>Min (µg/dl)</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>
<b>Max (µg/dl)</b>	<b>20.0</b>	<b>4.2</b>	<b>6.9</b>	<b>2.0</b>
<b>Ave (µg/dl)</b>	<b>3.7</b>	<b>2.0</b>	<b>2.8</b>	<b>1.5</b>
<b>GeoMean (µg/dl)</b>	<b>2.6</b>	<b>1.9</b>	<b>2.5</b>	<b>1.5</b>

# **2010 Basin Blood Lead Summary Statistics by Age (years)**

<b>Age</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>N</b>	<b>25</b>	<b>14</b>	<b>23</b>	<b>14</b>	<b>19</b>	<b>13</b>
<b>Min (µg/dl)</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>
<b>Max (µg/dl)</b>	<b>6.9</b>	<b>5.6</b>	<b>20.0</b>	<b>14.0</b>	<b>5.6</b>	<b>2.5</b>
<b>Ave (µg/dl)</b>	<b>2.4</b>	<b>2.5</b>	<b>3.0</b>	<b>2.7</b>	<b>2.3</b>	<b>1.8</b>
<b>GeoMean (µg/dl)</b>	<b>2.2</b>	<b>2.2</b>	<b>2.2</b>	<b>2.0</b>	<b>2.1</b>	<b>1.7</b>

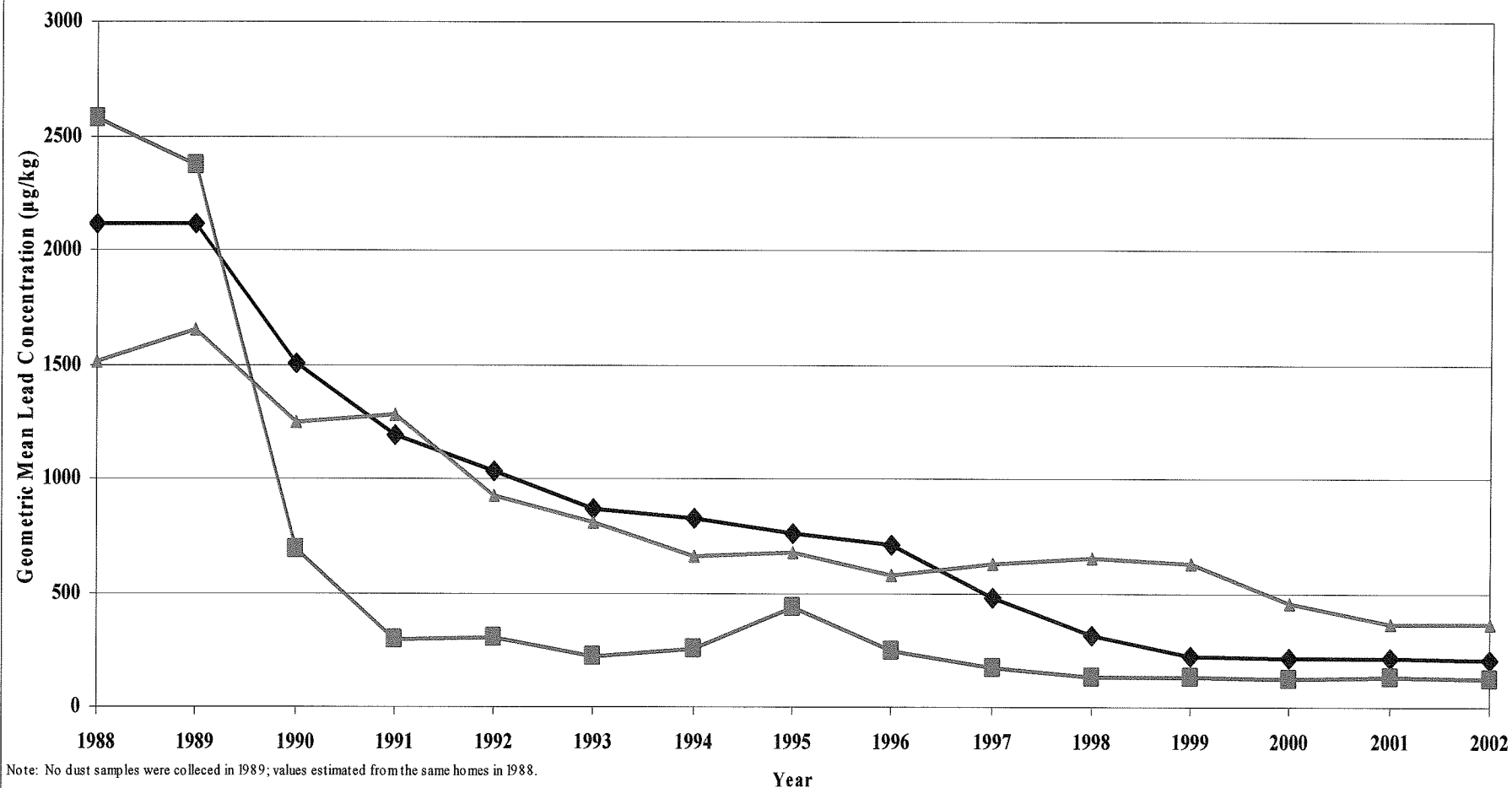
# Percentage of Parcels that have Consented and Refused Sampling

	Consented	Refused
<b>Mullan</b>	<b>99%</b>	<b>1%</b>
<b>Wallace &amp; Burke/Ninemile</b>	<b>98%</b>	<b>2%</b>
<b>Silverton</b>	<b>97%</b>	<b>3%</b>
<b>Osburn</b>	<b>99%</b>	<b>1%</b>
<b>Side Gulches</b>	<b>96%</b>	<b>4%</b>
<b>Pine Creek</b>	<b>97%</b>	<b>3%</b>
<b>Kingston</b>	<b>97%</b>	<b>3%</b>
<b>Lower Basin</b>	<b>86%</b>	<b>14%</b>
<b>Total</b>	<b>96%</b>	<b>4%</b>

Consents and refusals received from 2004 through October 2010.

# Box Soil and House Dust History

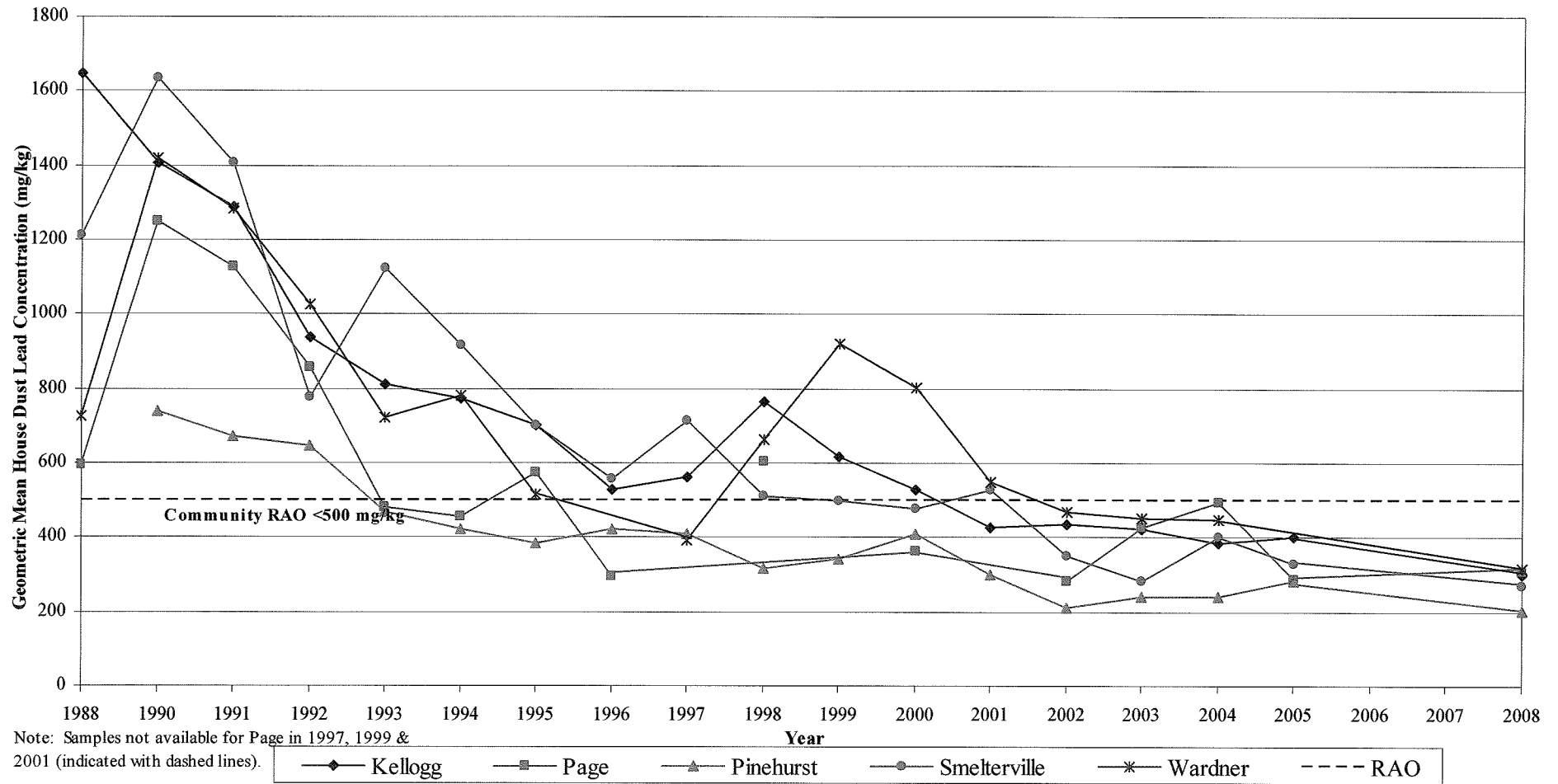
## Yard Soil Community Means and House Dust Lead Exposures 1988-2002, Kellogg



Note: No dust samples were collected in 1989; values estimated from the same homes in 1988.

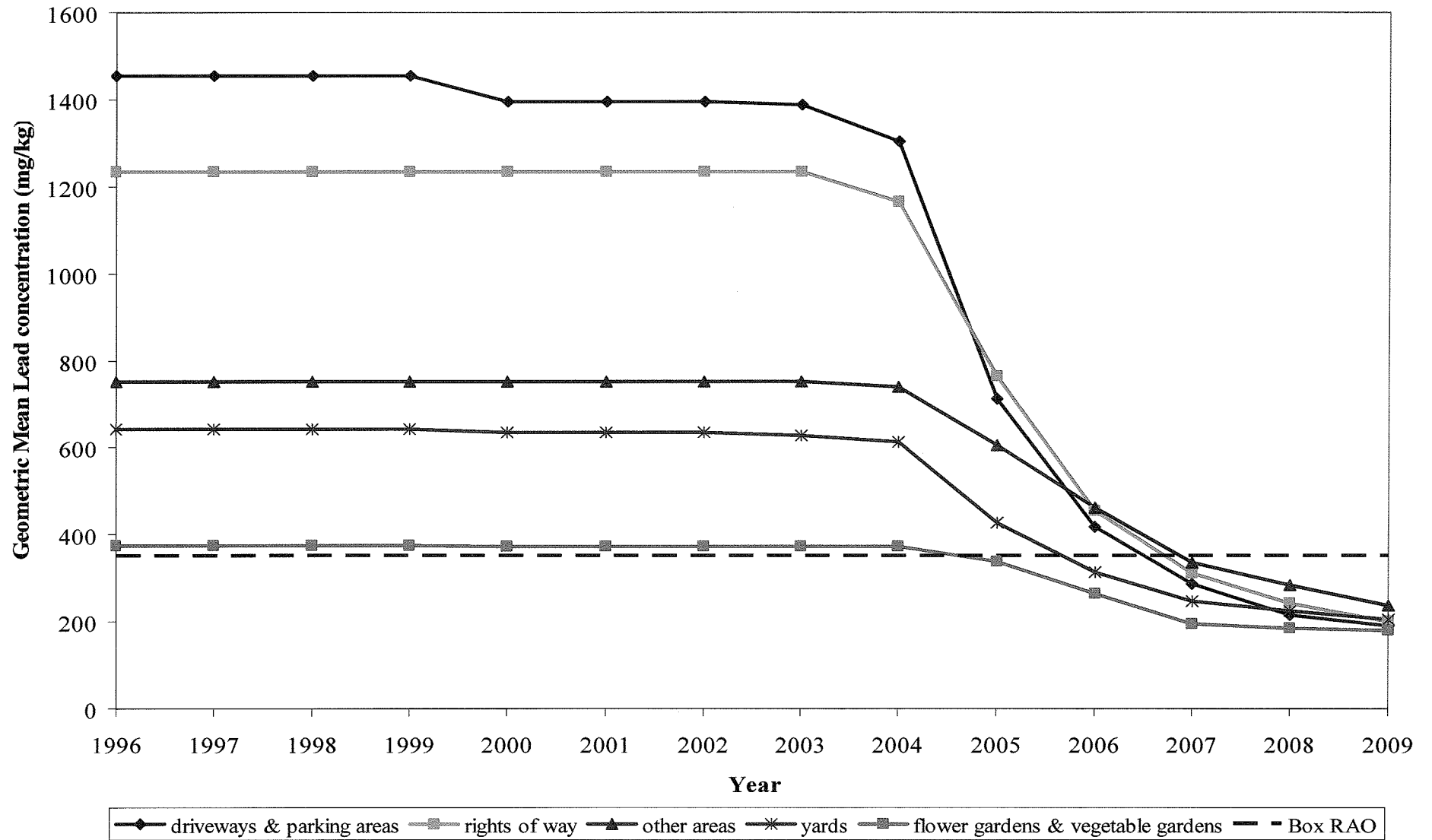
Community Wide Soil
  Yard Soil Exposure
  House Dust Exposure

House Dust Vacuum Bag Lead Concentration by City, 1988-2008

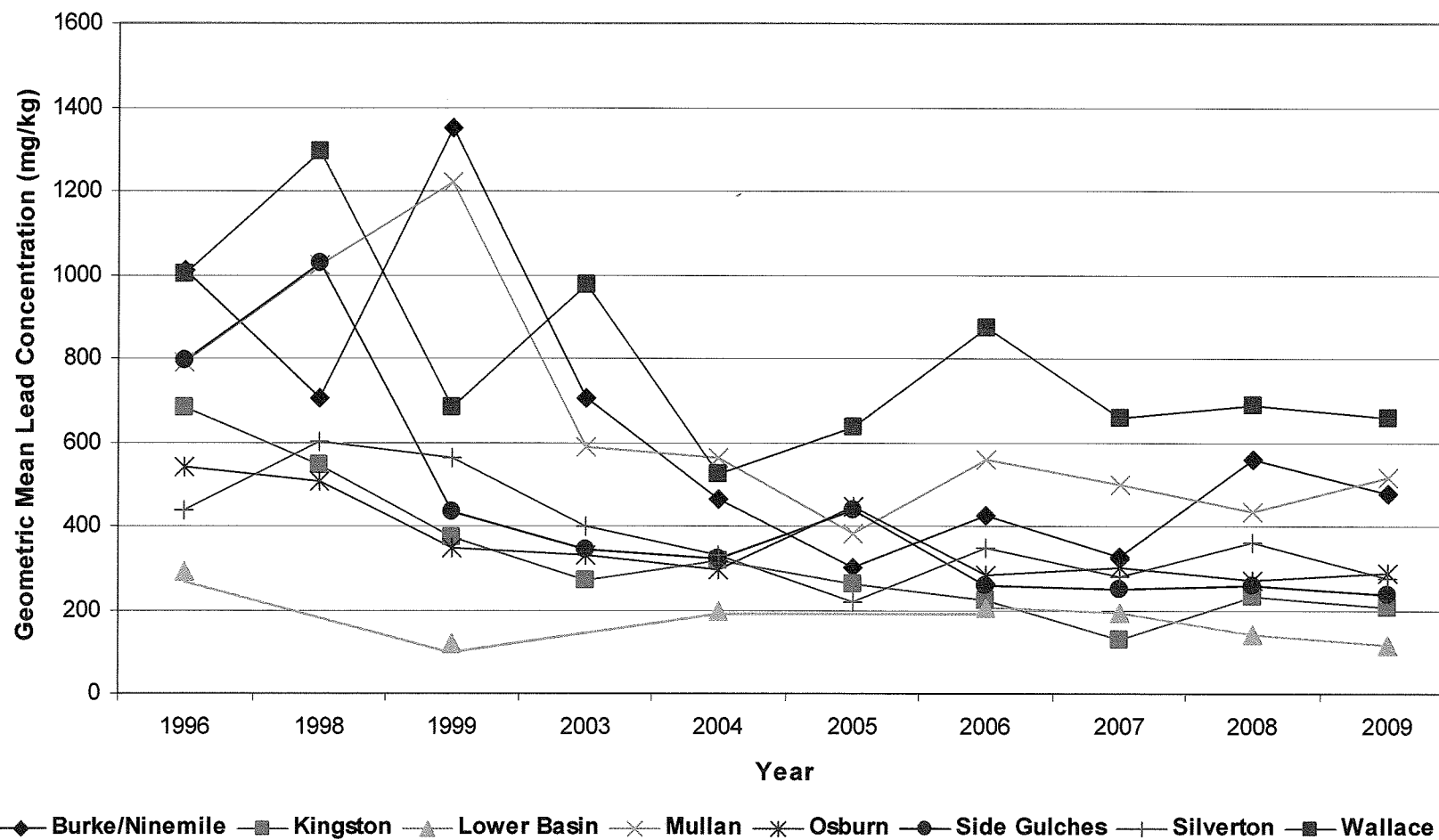


# Basin House Dust Exposure Monitoring

**Mullan Soil Community Means - By Sample Location**



**Community Mean Vacuum Bag Dust Lead Concentrations by Year and Geographic Area for the Basin, 1996-2009**



**Notes:**

Vacuum samples were not collected in 1997, 2000, or 2001. 2002 had too little data to display.

In 2005, only one vacuum sample was collected from the Lower Basin. When the number of samples is 2 or less, the results are not shown in order to maintain confidentiality.

# **NAS Investigation Health Related Conclusions**

# NAS Conclusions

- *“The committee found that scientific and technical practices used by EPA for decision making regarding human health risks in the Coeur d’Alene River Basin Superfund site are generally sound. The exceptions are minor.*
- *However, for EPA’s decision making regarding environmental protection, the committee has substantial concerns, particularly regarding the effectiveness and long-term protection of the selected remedy.”*

# NAS Conclusions

- *Furthermore, the potential long-term effectiveness of the proposed remedial actions is severely limited by frequent flooding events and their potential to recontaminate remediated areas with contaminated sediments.”*